

WHAT IS CLAIMED IS:

1. An energy storage device comprising:
  - a case having an opening;
  - an electrode assembly disposed within the case, the electrode assembly including at least a positive and a negative electrode member;
  - a cover disposed to cover the opening of the case, the cover defining a hole having a counter bore structure; and
  - a terminal structure attached to the cover, including:
    - a gasket made of an insulating material and fittingly disposed within the hole and the counter bore,
    - an under cover insulator member disposed below an under side of the cover, the insulator member defining a hole corresponding to the hole in the cover,
    - a washer made of a conductive material and electrically connected to one of the electrode members of the electrode assembly, the washer being disposed below the insulator member and defining a hole corresponding to the hole in the cover, and
    - a fastening device made of a conductive material and having a shaft passing through the gasket and the holes in the insulator member and the washer, the fastening device applying a pressure in an axial direction of the hole in the cover to press the gasket, the cover, the insulator and the washer against each other to form a seal, the fastening device being electrically connected to the washer and electrically insulated from the cover.
2. The energy storage device of claim 1, wherein the fastening device is electrically connected to one of the electrode members and forms a terminal of the energy storage device, and wherein the case is electrically connected to the other one of the electrode members and forms another terminal of the energy storage device.

3. The energy storage device of claim 1, wherein the fastening device has a head being in contact with the gasket, and wherein the terminal structure further comprises a sealing ring disposed between the head of the fastening device and the gasket, the sealing ring being compressed when the fastening device is fastened.

4. The energy storage device of claim 3, wherein the sealing ring is formed as an integral part of the gasket.

5. The energy storage device of claim 3, wherein the sealing ring is formed as an integral part of the head of the fastening device.

6. The energy storage device of claim 1, wherein the terminal structure further comprises a sealing ring disposed between the gasket and the cover, the sealing ring being compressed when the fastening device is fastened.

7. The energy storage device of claim 6, wherein the sealing ring is formed as an integral part of the gasket.

8. The energy storage device of claim 6, wherein the sealing ring is formed as an integral part of the cover in the counter bore.

9. An energy storage device, comprising:

a case having an opening;

an electrode assembly disposed within the case, the electrode assembly including at least a positive and a negative electrode member;

a cover disposed to cover the opening of the case, the cover defining a hole;

and

a terminal structure including a fastening device passing through the hole, the fastening device being electrically coupled to one of the electrode members of the

electrode assembly and forms a terminal of the energy storage device, wherein the fastening device is made of stainless steel.

10. An energy storage device comprising:

a case having an opening;

an electrode assembly disposed within the case, the electrode assembly including at least a positive and a negative electrode member;

a cover disposed to cover the opening of the case, the cover defining a hole having a counter bore structure; and

a plug fittingly disposed in the counter bore of the hole, the plug being fixed to the cover to seal the hole.

11. An energy storage device comprising:

a case having an opening;

an electrode assembly disposed within the case, the electrode assembly including at least a positive and a negative electrode member;

a cover disposed to cover the opening of the case and defining a hole, the cover being made of aluminum and electrically connected to one of the electrode members of the electrode assembly; and

a disk-shaped plug disposed to seal the hole, the plug being made of aluminum and electrically connected to the cover, the plug further having a layer of a second metal or metal alloy other than aluminum formed on a top surface thereof and electrically connected to the aluminum to form a terminal of the energy storage device.

12. The energy storage device of claim 11, wherein the second metal or metal alloy has a melting point higher than the melting point of aluminum.

13. The energy storage device of claim 11, wherein the second metal or metal alloy is selected from the group consisting of nickel, stainless steel, titanium, copper, and alloys thereof.

14. The energy storage device of claim 11, wherein the second metal or metal alloy layer is formed by deposition over the top surface of the aluminum.

15. The energy storage device of claim 11, wherein the second metal or metal alloy layer is a clad formed within a recess of the top surface of the aluminum.

16. An energy storage device comprising:

a case having an opening;

an electrode assembly disposed within the case, the electrode assembly including at least a positive and a negative electrode member;

a cover disposed to cover the opening of the case, the cover defining a first hole and a second hole, wherein the cover has a symmetrical shape and wherein the first and second holes are located symmetrically with respect to the cover and have identical shapes and sizes;

a terminal structure disposed in the first hole, the terminal structure being electrically connected to one of the electrodes to form a terminal of the energy storage device; and

a plug disposed to seal the second hole.

17. An energy storage device, comprising:

a case having an opening;

an electrode assembly disposed within the case, the electrode assembly including at least a positive and a negative electrode member; and

a cover disposed to cover the opening of the case,

wherein the cover defines a cutaway portion along a periphery of its underside to form a step surface, wherein the step surface contacts an upper rim of

the case, and wherein the case and the cover are joined together by laser welding near the contact surface.

18. An energy storage device, comprising:

a case having an opening;

an electrode assembly disposed within the case, the electrode assembly including at least a positive and a negative electrode member; and

a cover disposed to cover the opening of the case,

wherein an upper rim of the case defines a cutaway portion along an inner periphery thereof to form a step surface, wherein the step surface contacts an under side of the cover, and wherein the case and the cover are joined together by laser welding near the contact surface.

19. An energy storage device comprising:

a case having an opening;

a rolled electrode assembly disposed within the case, the rolled electrode assembly including a mandrel, a positive electrode member, a negative electrode member and one or more separator members separating the positive and negative electrode members, the electrode and separator members being stacked and wound around the mandrel to form a roll, the mandrel being electrically connected to one of the electrode members, wherein the mandrel is made from a metal plate having a center portion and two bent portions forming an S shape, the bend portions exerting a spring tension on the rolled electrode assembly; and

a cover disposed to cover the opening of the case.

20. The energy storage device of claim 19, wherein the mandrel is made of metal or metal alloy.

21. The energy storage device of claim 20, wherein the mandrel is made of copper, copper alloy, or nickel.

22. The energy storage device of claim 19, further comprising a terminal structure passing through a hole defined on the cover to form a terminal of the energy storage device, wherein the mandrel is electrically connected to the terminal structure.

23. The energy storage device of claim 19, further comprising a terminal connector made of a conductive material, the terminal connector having a base portion and a tab portion, the tab portion having two elongated portions forming a spring structure, and wherein the tab portion is inserted into the mandrel in a space between the center portion and one of the bent portions of the mandrel.

24. The energy storage device of claim 23, wherein the terminal connector is made of metal or metal alloy.

25. The energy storage device of claim 24, wherein the terminal connector is made of copper, copper alloy, or nickel.

26. The energy storage device of claim 24, further comprising a terminal structure passing through a hole defined on the cover to form a terminal of the energy storage device, wherein the base portion of the terminal connector is mechanically and electrically connected to the terminal structure.

27. An energy storage device, comprising:  
a case having an opening;  
an electrode assembly disposed within the case, the electrode assembly including at least a positive electrode member and a negative electrode member;  
a cover disposed to cover the opening of the case; and  
an adhesive insulating film disposed in the case to insulate a bottom of the case from a bottom part of the electrode assembly, the adhesive insulating film

being adhered to either the bottom of the case or the bottom of the electrode assembly.